PATENT ABSTRACTS OF JAPAN

(11)Publication number : **07-030888**
(43)Date of publication of application : **31.01.1995**

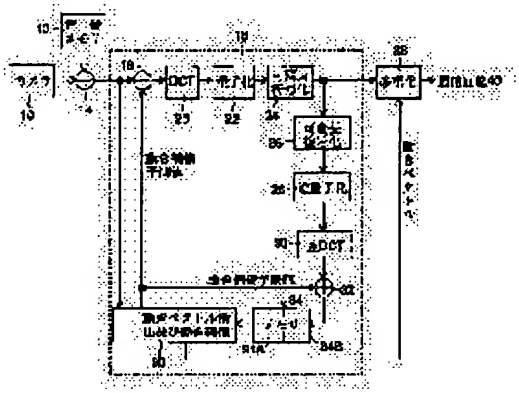
(51)Int.CI. **H04N 7/30**
G06T 9/00
H03M 7/40
H04N 7/14
H04N 7/32
H04N 11/04

(21)Application number : **05-153640**
(22)Date of filing : **24.06.1993**

(71)Applicant : **CANON INC**
(72)Inventor : **HIRABAYASHI KOJI**

(54) MOVING IMAGE TRANSMITTER AND MOVING IMAGE RECEIVER

(57)Abstract:
PURPOSE: To reduce the transmission code quantity for moving image transmission.
CONSTITUTION: A background image in an image pickup visual field is stored in advance in a background memory 12. A camera 10 picks up a portrait on a background stored in the background memory 12. A portrait extract circuit 14 compares a stored picture in the background memory 12 with a picked-up image by the camera 10 to extract a portion whose picture element is changed by a predetermined value or over as a portrait and sets 0 to other portions than the portrait. A motion compensation inter-frame coding circuit 16 applies motion compensation inter-frame coding to an output of the portrait extract circuit 14. A receiver side decodes image information subject to motion compensation inter-frame coding. A background stored in other background memory is synthesized to 0 level portions of the decoded image.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The dynamic-image sending set characterized by the bird clapper from a background memory means to memorize a background image, a non-background extraction means to extract a part for a non-background from the dynamic image which is going to transmit with reference to the background memory means concerned, and a coding means to encode the non-background image extracted by the non-background extraction means concerned.
[Claim 2] The dynamic-image sending set according to claim 1 which is a means by which the above-mentioned coding means encodes the non-background image extracted by the above-mentioned non-background extraction means between motion compensation screens.
[Claim 3] The dynamic-image receiving set characterized by the bird clapper from a decryption means to decrypt the dynamic-image information encoded by the non-background, a background memory means to memorize a background image, and a synthetic means to compound the background image memorized by the picture restored by the decryption means concerned at the background memory means concerned.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the dynamic-image sending set and dynamic-image receiving set in the dynamic-image transmission system which transmits a dynamic image like a TV conference or a TV phone.
[0002]
[Description of the Prior Art] There are three typical methods, an inter-frame differential-encoding method, an inter-frame differential-encoding method with a motion compensation, and the coding method in a frame, and after classifying one screen into two or more fields, i.e., a block, these coding methods are applied to a dynamic-image coding method about the pixel data within each block.
[0003] so that an inter-frame differential-encoding method encodes difference with the block of a homotopic spatially [the block which it is going to encode, and its front frame] and inter-frame correlation is strong -- difference -- since a value approaches zero, by the picture with little movement, high compressibility is expectable
[0004] between the blocks of the picture which a motion compensation inter-frame differential-encoding method seasons an inter-frame differential-encoding method with a motion compensation, and is most approximated within the block of near spatially centering on the block of a homotopic of front frame ** -- difference -- taking -- the difference -- a value is encoded for example, difference -- Huffman coding is carried out, after carrying out the discrete cosine transform of the data and quantizing the transform coefficient even if a move object is in a screen -- the difference of the move object -- a value -- small -- it can carry out -- high compressibility is expectable also by the picture with movement
[0005] The coding method in a frame is encoded only in the same screen. That is, Huffman coding is carried out, after carrying out the discrete cosine transform of the subject-copy image directly and quantizing the transform coefficient. difference -- by the two above-mentioned methods which encode a value, when inter-frame correlation is small, by taking difference, the dynamic range increases and amount of information increases on the contrary There is such no fault in the coding method in a frame.
[0006] Immediately after a scene switches, although coding in a frame is desirable, to the usual dynamic image of small movement, the motion compensation inter-frame coding method is most suitable.
[0007]
[Problem(s) to be Solved by the Invention] By the motion compensation inter-frame coding method, when the background of having stood it still in the block is included, a detection error occurs and, thereby, compressibility falls. That is, by the matching operation of motion vector detection, since the stationary background image will move relatively to a move body, the matching error according to the ratio of a move body and a background occurs with each block. As an extreme example, if the background is superior within a block, the effect of a motion compensation will be reduced and will cause aggravation depending on the case. That is, when an exact motion compensation is given to a move body, the background image will move and this makes the amount of generating signs increase.
[0008] this invention aims at showing the dynamic-image sending set and dynamic-image sending set which do not produce such un-arranging.
[0009]
[Means for Solving the Problem] The dynamic-image sending set concerning this invention is characterized by the bird clapper from a background memory means to memorize a background image, a non-background extraction means to extract a part for a non-background from the dynamic image which is going to transmit with reference to the background memory means concerned, and a coding means to encode the non-background image extracted by the non-background extraction means concerned.
[0010] The dynamic-image receiving set of the publication concerning this invention is characterized by the bird clapper from a decryption means to decrypt the dynamic-image information encoded by the non-background, a background memory means to memorize a background image, and a synthetic means to compound the background image memorized by the picture restored by the decryption means concerned at the background memory means concerned.
[0011]
[Function] the above-mentioned means -- typical -- non-background images, such as a person image, -- extracting -- it -- coding -- since it encodes between motion compensation screens and transmits preferably, the amount of modulation codes is sharply reducible In a receiving side, since it is memorizable against the background of a picture unrelated to the dynamic image transmitted to the background memory means of a receiving side, arbitrary backgrounds are compoundable in a decryption picture. Therefore, easily, the actual background of a transmitting side can be kept secret, or a specific background can be

displayed.
[0012]
[Example] Hereafter, the example of this invention is explained with reference to a drawing.
[0013] The outline configuration block view of the transmitting side of one example of this invention which applied drawing 1 to the TV phone machine, and drawing 2 show the outline configuration block view of a receiving side.
[0014] The composition and operation of a transmitting side which are shown in drawing 1 are explained. A camera 10 photos the person who should transmit. In addition, the person's background is beforehand photoed with a camera 12, and it memorizes beforehand as still picture data in the background memory 12. This still picture data presupposes that it is brightness data of a 8-bit range, and forbids use of zero value. That is, the pixel which is zero value is set to "1", and is memorized in the background memory 12. This background image transmits also to the receiving side beforehand again.
[0015] The person extraction circuit 14 compares with the photography picture from a camera 10 the background image memorized by the background memory 12, and extracts a portion with change more than fixed. Of course at this time, it is desirable to match between the background image memorized by the background memory 12 and the background included in the photography picture of a camera 10. Thereby, the output of the extraction circuit 14 consists only of a move body (this example person image), and the circumference becomes a zero value. In addition, the person extraction circuit 14 blocks one screen to a 16x16-pixel block, and outputs pixel data to the motion compensation inter-frame coding network 16 in order of a predetermined block.
[0016] The motion compensation inter-frame coding network 16 carries out motion compensation inter-frame coding of the output picture signal of the person extraction circuit 14. The motion compensation inter-frame coding network 16 consists of well-known composition, and explains the composition and operation briefly.
[0017] Inputting the output image data of the person extraction circuit 14 into motion vector detection and the motion compensation circuit 36 as the subtractor 18 which computes difference (prediction error) with the motion compensation forecast of a front frame, motion vector detection and the motion compensation circuit 36 detect the local decode value of a front frame, and the output lost-motion vector of the person extraction circuit 14, and output a motion compensation forecast to a subtractor 18.
[0018] The discrete cosine transform (DCT) circuit 20 carries out the discrete cosine transform of the prediction error which a subtractor 18 outputs per block, and outputs DCT transform coefficient data to the quantization circuit 22. The quantization circuit 22 quantizes DCT transform coefficient data in predetermined quantization-step size, and the variable-length-coding circuit 24 carries out variable length coding of the output of the quantization circuit 22. The output of the variable-length-coding circuit 24 turns into a coding output of the motion compensation inter-frame coding network 16, and is impressed to the multiplexing circuit 38.
[0019] A variable length sign decryption is carried out by the variable length decryption circuit 26, and it is reverse-quantized by the reverse quantization circuit 28, and the reverse discrete cosine transform of the output sign of the variable-length-coding circuit 24 is carried out by the reverse DCT circuit 30. An adder 32 adds a motion compensation forecast (motion vector detection and output of the motion compensation circuit 36) to the output of the reverse DCT circuit 30. The output of an adder 32 is a local decode value, and is stored in a frame memory 34 as a forecast of the following frame. A frame memory 34 possesses frame-memory partial 34A which memorizes the local decode value of a front frame, and frame-memory partial 34B which performs the present writing.
[0020] The image data of the front frame read from frame-memory 34A is impressed to motion vector detection and the motion compensation circuit 36. Motion vector detection and the motion compensation circuit 36 output the forecast which detected the motion vector according to a matching operation with the image data from the person extraction circuit 14, and carried out the motion compensation to a subtractor 18 and an adder 32. The detected motion vector is impressed to the multiplexing circuit 38.
[0021] The multiplexing circuit 38 multiplexes the motion vector information from the output (specifically output of the variable-length-coding circuit 24) of the motion compensation inter-frame coding network 16, and motion vector detection and the motion compensation circuit 36. This multiplex information is inputted into the receiving side shown in drawing 2 through a communication line 40.
[0022] The receiving-side equipment shown in drawing 2 operates as follows. That is, the multiplexing information which transmitted the communication line 40 is inputted into the separation circuit 42, and it separates into coded-image information and a motion vector, and it is inputted into the decryption circuit 44. In the decryption circuit 44, the variable length decryption circuit 46 decrypts the variable length sign of encoded information, the reverse quantization circuit 48 reverse-quantizes, and the reverse DCT circuit 50 carries out a reverse discrete cosine transform. An adder 52 adds a motion compensation forecast to the output of the reverse DCT circuit 50. The output of an adder 52 turns into an output of the decryption circuit 44. The picture signal which an adder 52 outputs shows the restoration picture of the received portrait image.
[0023] This restoration picture is stored temporarily at a frame memory 54 for the forecast of the following frame. The REMU memory 54 possesses frame-memory partial 54A which memorizes the decode value of a front frame, and frame-memory partial 54B which performs the present writing like a frame memory 34. The forecast which carried out the motion compensation with reference to the motion vector from the separation circuit 42 is supplied to an adder 52 from memory 54A.
[0024] The receiving image data restored by the decryption circuit 44 is impressed to an adder 56. The background image (namely, the usually same background image as the background memory 12 memorizes) beforehand transmitted from the transmitting side is stored in the background memory 58, and the background-image data is outputted to an adder 56.
[0025] An adder 56 compounds the image data from the background memory 58 into the zero value portion of a receiving

picture, and impresses it to it at a monitor 60. The picture which piled up the person image transmitted as a dynamic image is formed on the stationary background image by this, and graphic display of this picture is carried out on the screen of a monitor 60.

[0026] There is no need that the background image memorized by the background memory 12 of a transmitting side and the background image memorized by the background memory 58 of a receiving side are the same. For example, it is [that it is / where he does not want to transmit an actual background / a case, and] useful to transmit a person to another specific background in piles. What is necessary is to transmit to a receiving side by making the file-ized picture and the picture of somewhere else into a background image, and just to store in the background memory 58. What is necessary is just to specify the specification code before dynamic-image transmission, when the file of the background-image information to be used is in a receiving side.
[0027] The background memory 12 memorizes the image information used as the foundation for removing a background image from a photography picture with a camera 10. The background within the photography visual field of a camera 10 is changed delicately or sharply with a camera deflection, a pan, zoom, etc. As for the background memory 12, it is desirable that the image data of the bigger range than one usual screen is memorizable so that the change range predicted can be covered. Moreover, the extraction of the person portion in the person extraction circuit 14 of a bird clapper is easily natural by referring to the operation information on a camera 10 (zoom, a focal distance, a pan angle, tilt angle, etc.).
[0028] Although the coding method which uses DCT, quantization, and variable length coding was illustrated, this invention is not limited to such a coding method.
[0029]
[Effect of the Invention] According to this invention, the amount of signs which dynamic-image transmission takes can be sharply decreased so that he can understand easily from the above explanation. Moreover, since arbitrary backgrounds can be chosen, it is [that it is / where he wants to keep the actual background of a transmitting side secret / a case, and] very convenient to use a specific background.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Industrial Application] this invention relates to the dynamic-image sending set and dynamic-image receiving set in the dynamic-image transmission system which transmits a dynamic image like a TV conference or a TV phone.

[Translation done.]

PRIOR ART

[Description of the Prior Art] There are three typical methods, an inter-frame differential-encoding method, an inter-frame differential-encoding method with a motion compensation, and the coding method in a frame, and after classifying one screen into two or more fields, i.e., a block, these coding methods are applied to a dynamic-image coding method about the pixel data within each block.

[0003] so that an inter-frame differential-encoding method encodes difference with the block of a homotopic spatially [the block which it is going to encode, and its front frame] and inter-frame correlation is strong -- difference -- since a value approaches zero, by the picture with little movement, high compressibility is expectable

[0004] between the blocks of the picture which a motion compensation inter-frame differential-encoding method seasons an inter-frame differential-encoding method with a motion compensation, and is most approximated within the block of near spatially centering on the block of a homotopic of front frame ** -- difference -- taking -- the difference -- a value is encoded for example, difference -- Huffman coding is carried out, after carrying out the discrete cosine transform of the data and quantizing the transform coefficient even if a move object is in a screen -- the difference of the move object -- a value -- small -- it can carry out -- high compressibility is expectable also by the picture with movement

[0005] The coding method in a frame is encoded only in the same screen. That is, Huffman coding is carried out, after carrying out the discrete cosine transform of the subject-copy image directly and quantizing the transform coefficient. difference -- by the two above-mentioned methods which encode a value, when inter-frame correlation is small, by taking difference, the dynamic range increases and amount of information increases on the contrary There is such no fault in the coding method in a frame.

[0006] Immediately after a scene switches, although coding in a frame is desirable, to the usual dynamic image of small movement, the motion compensation inter-frame coding method is most suitable.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the amount of signs which dynamic-image transmission takes can be sharply decreased so that he can understand easily from the above explanation. Moreover, since arbitrary backgrounds can be chosen, it is [that it is / where he wants to keep the actual background of a transmitting side secret / a case, and] very convenient to use a specific background.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the motion compensation inter-frame coding method, when the background of having stood it still in the block is included, a detection error occurs and, thereby, compressibility falls. That is, by the matching operation of motion vector detection, since the stationary background image will move relatively to a move body, the matching error according to the ratio of a move body and a background occurs with each block. As an extreme example, if the background is superior within a block, the effect of a motion compensation will be reduced and will cause aggravation depending on the case. That is, when an exact motion compensation is given to a move body, the background image will move and this makes the amount of generating signs increase.
[0008] this invention aims at showing the dynamic-image sending set and dynamic-image sending set which do not produce such un-arranging.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] The dynamic-image sending set concerning this invention is characterized by the bird clapper from a background memory means to memorize a background image, a non-background extraction means to extract a part for a non-background from the dynamic image which is going to transmit with reference to the background memory means concerned, and a coding means to encode the non-background image extracted by the non-background extraction means concerned.
[0010] The dynamic-image receiving set of the publication concerning this invention is characterized by the bird clapper from a decryption means to decrypt the dynamic-image information encoded by the non-background, a background memory means to memorize a background image, and a synthetic means to compound the background image memorized by the picture restored by the decryption means concerned at the background memory means concerned.

[Translation done.]

OPERATION

[Function] the above-mentioned means -- typical -- non-background images, such as a person image, -- extracting -- it -- coding -- since it encodes between motion compensation screens and transmits preferably, the amount of modulation codes is sharply reducible In a receiving side, since it is memorizable against the background of a picture unrelated to the dynamic image transmitted to the background memory means of a receiving side, arbitrary backgrounds are compoundable in a decryption picture. Therefore, easily, the actual background of a transmitting side can be kept secret, or a specific background can be displayed.

[Translation done.]

EXAMPLE

[Example] Hereafter, the example of this invention is explained with reference to a drawing.
[0013] The outline configuration block view of the transmitting side of one example of this invention which applied drawing 1 to the TV phone machine, and drawing 2 show the outline configuration block view of a receiving side.
[0014] The composition and operation of a transmitting side which are shown in drawing 1 are explained. A camera 10 photos the person who should transmit. In addition, the person's background is beforehand photoed with a camera 12, and it memorizes beforehand as still picture data in the background memory 12. This still picture data presupposes that it is brightness data of a 8-bit range, and forbids use of zero value. That is, the pixel which is zero value is set to "1", and is memorized in the background memory 12. This background image transmits also to the receiving side beforehand again.
[0015] The person extraction circuit 14 compares with the photography picture from a camera 10 the background image memorized by the background memory 12, and extracts a portion with change more than fixed. Of course at this time, it is desirable to match between the background image memorized by the background memory 12 and the background included in the photography picture of a camera 10. Thereby, the output of the extraction circuit 14 consists only of a move body (this example person image), and the circumference becomes a zero value. In addition, the person extraction circuit 14 blocks one screen to a 16x16-pixel block, and outputs pixel data to the motion compensation inter-frame coding network 16 in order of a predetermined block.
[0016] The motion compensation inter-frame coding network 16 carries out motion compensation inter-frame coding of the output picture signal of the person extraction circuit 14. The motion compensation inter-frame coding network 16 consists of well-known composition, and explains the composition and operation briefly.
[0017] Inputting the output image data of the person extraction circuit 14 into motion vector detection and the motion compensation circuit 36 as the subtractor 18 which computes difference (prediction error) with the motion compensation forecast of a front frame, motion vector detection and the motion compensation circuit 36 detect the local decode value of a front frame, and the output lost-motion vector of the person extraction circuit 14, and output a motion compensation forecast to a subtractor 18.
[0018] The discrete cosine transform (DCT) circuit 20 carries out the discrete cosine transform of the prediction error which a subtractor 18 outputs per block, and outputs DCT transform coefficient data to the quantization circuit 22. The quantization circuit 22 quantizes DCT transform coefficient data in predetermined quantization-step size, and the variable-length-coding circuit 24 carries out variable length coding of the output of the quantization circuit 22. The output of the variable-length-coding circuit 24 turns into a coding output of the motion compensation inter-frame coding network 16, and is impressed to the multiplexing circuit 38.
[0019] A variable length sign decryption is carried out by the variable length decryption circuit 26, and it is reverse-quantized by the reverse quantization circuit 28, and the reverse discrete cosine transform of the output sign of the variable-length-coding circuit 24 is carried out by the reverse DCT circuit 30. An adder 32 adds a motion compensation forecast (motion vector detection and output of the motion compensation circuit 36) to the output of the reverse DCT circuit 30. The output of an adder 32 is a local decode value, and is stored in a frame memory 34 as a forecast of the following frame. A frame memory 34 possesses frame-memory partial 34A which memorizes the local decode value of a front frame, and frame-memory partial 34B which performs the present writing.
[0020] The image data of the front frame read from frame-memory 34A is impressed to motion vector detection and the motion compensation circuit 36. Motion vector detection and the motion compensation circuit 36 output the forecast which detected the motion vector according to a matching operation with the image data from the person extraction circuit 14, and carried out the motion compensation to a subtractor 18 and an adder 32. The detected motion vector is impressed to the multiplexing circuit 38.
[0021] The multiplexing circuit 38 multiplexes the motion vector information from the output (specifically output of the variable-length-coding circuit 24) of the motion compensation inter-frame coding network 16, and motion vector detection and the motion compensation circuit 36. This multiplex information is inputted into the receiving side shown in drawing 2 through a communication line 40.
[0022] The receiving-side equipment shown in drawing 2 operates as follows. That is, the multiplexing information which transmitted the communication line 40 is inputted into the separation circuit 42, and it separates into coded-image information and a motion vector, and it is inputted into the decryption circuit 44. In the decryption circuit 44, the variable length decryption circuit 46 decrypts the variable length sign of encoded information, the reverse quantization circuit 48 reverse-quantizes, and the reverse DCT circuit 50 carries out a reverse discrete cosine transform. An adder 52 adds a motion compensation forecast to the output of

the reverse DCT circuit 50. The output of an adder 52 turns into an output of the decryption circuit 44. The picture signal which an adder 52 outputs shows the restoration picture of the received portrait image.
[0023] This restoration picture is stored temporarily at a frame memory 54 for the forecast of the following frame. The REMU memory 54 possesses frame-memory partial 54A which memorizes the decode value of a front frame, and frame-memory partial 54B which performs the present writing like a frame memory 34. The forecast which carried out the motion compensation with reference to the motion vector from the separation circuit 42 is supplied to an adder 52 from memory 54A.
[0024] The receiving image data restored by the decryption circuit 44 is impressed to an adder 56. The background image (namely, the usually same background image as the background memory 12 memorizes) beforehand transmitted from the transmitting side is stored in the background memory 58, and the background-image data is outputted to an adder 56.
[0025] An adder 56 compounds the image data from the background memory 58 into the zero value portion of a receiving picture, and impresses it to it at a monitor 60. The picture which piled up the person image transmitted as a dynamic image is formed on the stationary background image by this, and graphic display of this picture is carried out on the screen of a monitor 60.

[0026] There is no need that the background image memorized by the background memory 12 of a transmitting side and the background image memorized by the background memory 58 of a receiving side are the same. For example, it is [that it is / where he does not want to transmit an actual background / a case, and] useful to transmit a person to another specific background in piles. What is necessary is to transmit to a receiving side by making the file-ized picture and the picture of somewhere else into a background image, and just to store in the background memory 58. What is necessary is just to specify the specification code before dynamic-image transmission, when the file of the background-image information to be used is in a receiving side.
[0027] The background memory 12 memorizes the image information used as the foundation for removing a background image from a photography picture with a camera 10. The background within the photography visual field of a camera 10 is changed delicately or sharply with a camera deflection, a pan, zoom, etc. As for the background memory 12, it is desirable that the image data of the bigger range than one usual screen is memorizable so that the change range predicted can be covered. Moreover, the extraction of the person portion in the person extraction circuit 14 of a bird clapper is easily natural by referring to the operation information on a camera 10 (zoom, a focal distance, a pan angle, tilt angle, etc.).
[0028] Although the coding method which uses DCT, quantization, and variable length coding was illustrated, this invention is not limited to such a coding method.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

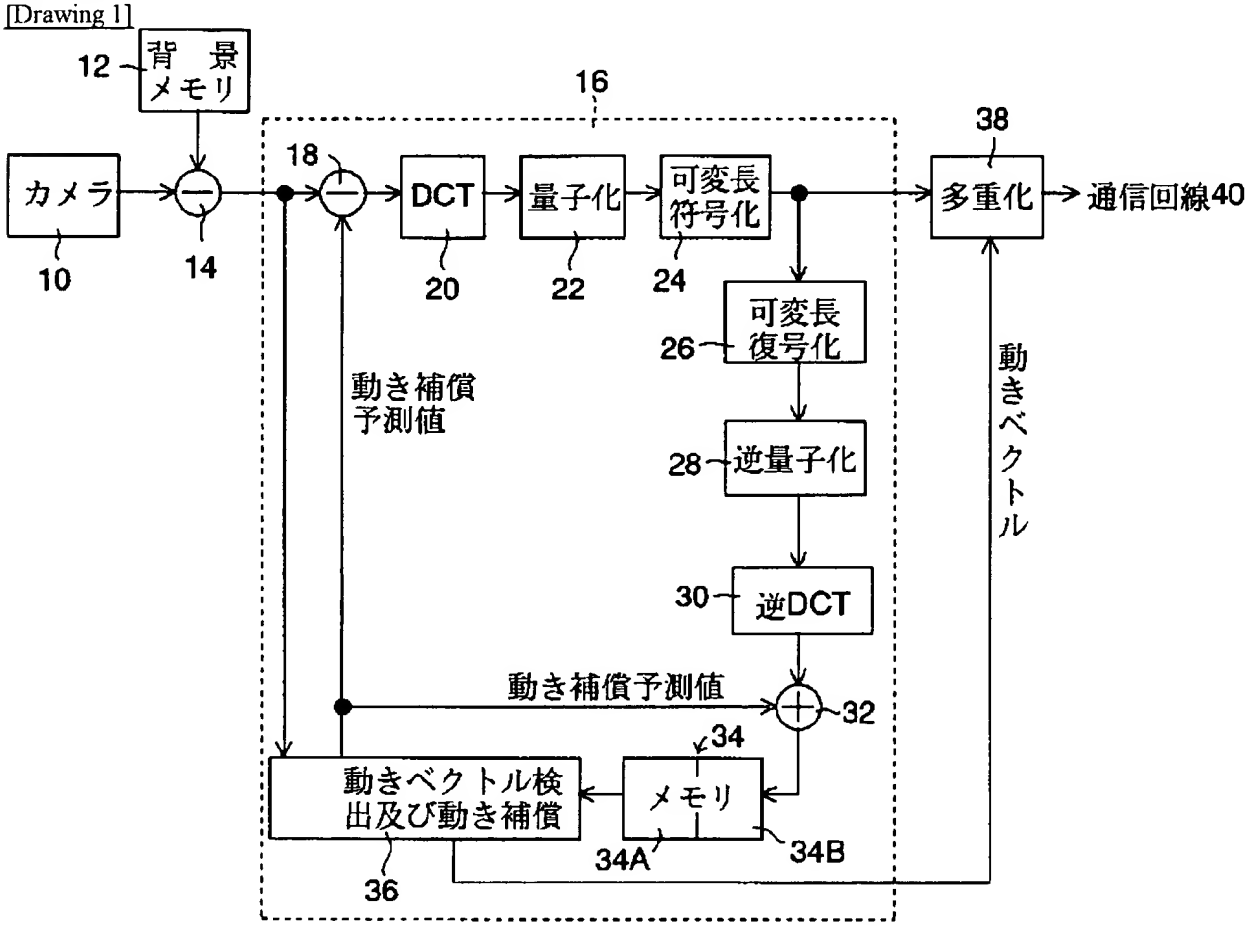
[Brief Description of the Drawings]
[Drawing 1] It is the outline configuration block view of the transmitting side of one example of this invention.
[Drawing 2] It is the outline configuration block view of the receiving side of this example.
[Description of Notations]
10: camera 12:background memory 14:person extraction circuit 16:motion compensation inter-frame coding network 18: -- subtractor 20:discrete cosine transform circuit 22:quantization circuit 24:variable-length-coding circuit Variable length decryption circuit 28:reverse quantization circuit 30:reverse DCT circuit 32: -- adder 34, 34A, and 34B:frame memory 36:motion vector detection and motion compensation circuit 38:multiplexing circuit 40: -- communication line 42:separation circuits 44: Decryption circuit 46: Variable length decryption circuit 48: Reverse quantization circuit 50: Reverse DCT circuit 52: Adder 54, 54A, 54B: Frame memory 56: Adder 58: Background memory 50: Monitor

[Translation done.]

* NOTICES *

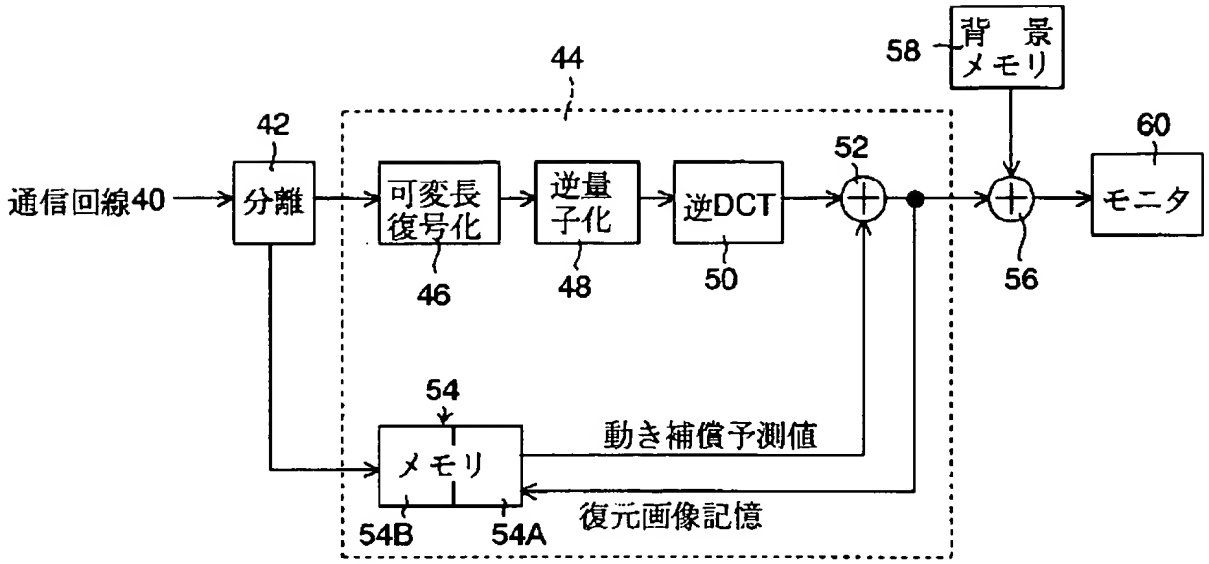
DRAWINGS

[Drawing 1]



[Drawing 2]

10: Camera
12: Camera/background memory
14: person Extraction Circuit.
16: Interframe coding network
38: multiplexer



[Translation done.]

40: Communication line
42: Separation circuit
44: decryption circuit
58: background memory
60: monitor